

Specification:

Descriptive Title of Invention

Exercise and training device for swimming

Cross-Reference to Related Applications

The benefit is claimed of,

USPTO Provisional Patent Application

Application Number 60/439,477

Filing date 01/13/2003.

Confirmation Number 6249

Filing Receipt *OC000000009445214*

Background of the Invention

The field of endeavor to which the claimed invention pertains is that of resistance exercise and training for swimming. Resistance training is a widely accepted component of overall training programs for exercise swimmers and competitive swimmers, wherein the muscles of the user's limbs or torso move in opposition to a resistive force. Resistance training is aimed at providing a stimulus for muscular adaptation whereby the user becomes able to apply greater force in producing swimming movements, and is therefore capable of achieving higher velocities in swimming speed. Resistance training for swimming has long been a controversial subject among sports scientists. Studies have demonstrated that many traditional resistance training methods show little if any correlation to improvements in swimming performance. Other studies have shown that traditional resistance training methods have a negative influence on swimming performance by causing the user to habituate a slower than desired stroke rate and shorter than desired stroke length, both of which negatively affect swimming velocity. The shortcomings of existing resistance-providing devices are commonly attributed to their failing to conform to the sports science principles of

specificity and progressive overload, both of which are widely held by sports scientists as essential to reaching maximum levels of swimming fitness and skill.

The principle of specificity in sports as relates to swimming dictates that in order for swimming performance to improve as a result of an activity, that activity must be highly related to the actual demands of swimming. Many of the traditional methods for providing resistance to muscles are engaged in while out of the water, and include barbells, dumbbells, rubber tubing, medicine balls, and resistance machines such as Nautilus and Universal Gym. These all provide a means to achieve basic conditioning early in the seasonal training or exercise program, but fail to provide for several key requirements that must be met in order to achieve optimal swimming performance. To be specific to swimming, resistance training has to meet the following four requirements, highlighted in the following discussion.

First, the movement must be performed in an orientation that is identical to swimming posture. This requires a horizontal body position of the user with unrestricted rotation of the user along the users' long axis, that being side-to-side, and the short axis, that being front-to-back.

Second, movement of the hands, the feet, and the limbs, must be identical to that of the swimming stroke of interest, by allowing the same movement pattern and range.

Third, the rate of movement of the hands, the feet, and the limbs, must be identical to the desired swimming

stroke rate. This can most conveniently be measured as the number of strokes performed per second.

Fourth, the type of resistance must identical to that encountered in swimming. This means the resistance must occur along the entire propelling surface of the hands, the feet, and the limbs, and the resistance acting upon the user must be provided by water. The resistance must also be directed horizontally and in direct opposition to the line of travel.

With regard to the commonly held sports science principle of progressive overload, particularly as relates to resistance exercise and training, the principle of progressive overload dictates that in order for continued improvements to occur, a means must exist for incrementally increasing resistance levels as the user improves. Accordingly, in order to continue making beneficial gains in swimming specific muscular adaptation, there must be a means for gradually increasing the resistance as training progresses over a period of days, weeks, months, and years. The principle of progressive overload is most often not accommodated by existing devices because they fail to provide a means for incrementally increasing resistance levels as the user improves.

Following is a discussion with reference to specific problems involved in the prior art found in the field of endeavor to which the claimed invention pertains.

Various devices exist which are generically referred to as swim benches, and are used while the user is not in the water. Several examples include U.S. Pat. Nos.

5,158,513; 5,376,060; 5,540,591; 5,603,676; 5,743,832; and 6,352,493. With these devices, the user reclines in the prone or supine position on a platform for the purpose of moving the user's limbs in opposition to a resistive force provided by the device. Some swim benches allow the necessary horizontal body position, but fail to truly allow for the subtle complexities of the long or short axis rotation of the user's body that occurs in an actual swimming stroke. Other swim benches, in order to use the force of gravity acting upon the user's body-mass as the source of resistance, require the user to remain in an inclined rather than horizontal position. Whether a user can perform movements of the desired rate and length on these body-weight resistance swim benches depends on the strength of the individual. None of the currently available swim benches provide the means to truly replicate the subtle complexities of an actual swimming stroke. Lastly, swim benches require the user to pull with just the hand on a paddle attached to a cord, which does little to develop the kinesthetic and tactile awareness of the total hand/arm complex commonly held to be essential in discerning the ideal movements necessary to provide propulsion in swimming.

Improvements of some of the limitations of swim benches are seen in various resistance-producing devices placed by the side of a swimming pool, to which the user is tethered. Examples include U.S. Pat. Nos. 3,861,675; 5,391,080; and 5,938,565. With these pool-side resistance devices, the user commonly wears a belt attached by a cable to the device. The cable feeds out from the device at a restricted rate that constitutes a resisting load opposing the horizontal progress of the user as the user attempts to swim away from the device. In some examples,

resistance is provided by a motor or other means of applying a braking action to the cable. In further examples, resistance is provided by a pulley system and a stack of selectable weights such as those commonly found as components of Nautilus and Universal resistance machines. In some home-made versions of these devices, the weights to be lifted as the user attempts to swim out the cable is provided by a basket of any manner of weighted objects, or even a bucket of water. All these devices allow the correct orientation in the water and a means for providing progressive resistance. Unfortunately, these machines are big and bulky and allow only one user to perform in a given area at a time, making these devices impractical given the crowded conditions that exist in many community swimming pools during fitness swims, and during swimming training programs. The cost of these devices is generally prohibitive for an individual user, and they are extremely inconvenient to move for short-term storage when not in use.

Improving upon the economic and storage difficulties presented by pool-side resistance devices, are various examples of tethering devices whereby a user wears a belt attached to length of cord, either stretchable or non-stretchable, with the opposite end of the cord attached to a stationary object, such as a pool ladder. A common variation of tethering devices includes a flexible rod in conjunction with or in place of a cord. Examples of these devices include U.S. Pat. Nos. 5,344,373; 5,556,353; 5,846,167; 6,251,049; and 6,634,993. All these devices provide the correct positioning of the user in the water, but as the user moves further down the pool, the resistance encountered from stretchable tethering devices

becomes greater and greater until the user is unable to make forward progress and begins to strip the hands, the feet, and the limbs, through the water, an action that is contrary to that required for effective swimming technique. Non-stretchable tethering devices produce this undesirable effect immediately. All tethering devices habituate a slower swimming stroke rate and stroke length than is desirable. As with pool-side resistance devices, these tethering devices also only allow one swimmer to perform in a given area at a time.

Improving upon the inappropriately severe and unnatural levels of resistance encountered with tethering devices, are various examples of devices commonly known as drag chutes and drag suits. Examples of drag suit devices include U.S. Pat. Nos. 4,302,007 and 5,487,710. Drag chutes consist of a piece of parachute-shaped fabric attached to the user by a belt and an adjoining length of cord. An example of this type of device as described for use on land by runners is typified by U.S. Pat. No. 5,472,394. Models specifically designed for use while swimming are very similar, but smaller in size. As the user swims through the water, drag chutes provides resistance in a manner similar to the method used to slow cars as seen in the sport of drag racing. Drag chutes as used in swimming are deficient in that they only provide one option for the level of resistance per unit, and that level of resistance may not be appropriate for a particular user. Drag suits consist of swimming suits to which are attached pockets of extra material designed to trap water, and thus provide a means of resisting forward progress. All drag suit devices provide the correct postural orientation and resistance medium, but in some cases provide only one option for the resistance level

per unit, or at most a very narrow range of resistance levels particularly deficient in the higher levels needed to provide the swimming muscles with a stimulus for beneficial adaptation as the user improves or for users who are already able to overcome a high level of resistance.

Another category of resistance devices includes what are generically known as hand paddles. Examples of these types of devices are U.S. Pat. Nos. 5,643,027; 6,019,650; and 6,398,603. Hand paddles are comprised of sheets of plastic or similar material cut to surface areas ranging from slightly larger than the user's hand to several times larger than the user's hand. These hand paddles are attached to the palm of the users hand by various means. Hand paddles allow the user to assume the necessary horizontal body position in the water, but have been found to unnaturally alter the desired swimming stroke pattern and length performed by the user. Whether or not desired swimming stroke rate can be maintained will depend on the size of the paddle compared to the strength of the user, and there is no provision within a given unit for progressively increasing the level of resistance as the user improves. An additional disadvantage of hand paddles is that they deprive the user of the very important kinesthetic and tactile awareness derived from water pressure on the hand and fingers.

The practice of a user swimming while towing a common bucket has been known for several decades, and presents two disadvantages, the first being the provision of either too little or too great a level of resistance, dependant on the ability of the user. The second problem is that a single common bucket cannot provide

progressively increasing levels of resistance as the user improves. An attempt to address these concerns by providing a wide variety of bucket sizes would prove impractical in terms of clutter at pool-side and inconvenience in storage.

Other lesser-known devices provide resistance encountered by the user while swimming, the resistance being caused by the projection of one or more members into the water and presenting surface area approaching right angles or at right angles to the user's direction of travel. The resistance level is variable in some examples and non-variable in others. Resistance-providing members project from a belt worn around the torso, and thus unavoidably cause an unnatural and deleterious force to act upon the user which acts to alter true horizontal swimming body-position, interfering with both long axis, that being side-to-side, and short axis, that being front-to-back, rotation of the user. The result is the habituation of undesirable changes to swimming technique as the user naturally attempts to offset these forces. Examples of these types of devices include U.S. Pat. Nos. 5,002,268 and 5,001,137.

Brief Summary of the Invention

The object of the claimed invention is to provide an ideal means for resistance exercise and training for swimming.

The claimed invention conforms to the commonly held sports science principles of specificity and progressive overload. Specificity is accommodated because the user uses the invention while in the water, the specific medium. The principle of specificity is further

accommodated because the variety of resistance levels provided by the claimed invention allows for selection of the correct resistance level to allow the user to perform with the desired stroke rate and desired stroke length. The principle of progressive overload is accommodated because the variety of resistance levels provided by the claimed invention allows for progressive incremental increase of resistance experienced by the user when performing with the claimed invention.

The claimed invention allows the user to perform with horizontal swimming posture with unrestricted rotation of the user along the user's long axis, that being side-to-side, and the short axis, that being front-to-back. The claimed invention allows swimming movements to be performed by the user in a manner that is identical to the swimming stroke of interest with respect to movement pattern and range of motion. While using the claimed invention, the user is able to perform swimming movements that are identical to the desired swimming stroke rate, as measured by the number of strokes per second. The claimed invention allows the user to experience actual water resistance, with that resistance occurring along the entire propelling surface of the hands, arms, feet, and legs. The resistance experienced by the user when using the claimed invention is directed horizontally and in direct opposition to the line of travel, as is experienced in non-resisted swimming.

Where prior examples in this field of endeavor violate the principle of specificity by requiring the user to perform with the user in the inclined body position, the claimed invention constitutes an improvement by allowing the user to use the invention with the user oriented in

the correct horizontal body position necessary for true swimming.

Where prior examples in this field of endeavor violate the principle of specificity by requiring the user to be located somewhere other than in the water, the claimed invention constitutes an improvement by allowing the user to use the invention in the water, the only medium specific to swimming.

Where prior examples in this field of endeavor violate the principle of specificity by failing to provide the variety of resistance levels necessary to accommodate the abilities of a wide range of users, the claimed invention constitutes an improvement by providing a wide range of resistance levels.

Where prior examples in this field of endeavor violate the principle of specificity by failing to allow the user to truly replicate the subtle complexities of an actual swimming stroke, the claimed invention constitutes an improvement by allowing the user to use the invention while performing actual swimming strokes.

Where prior examples in this field of endeavor violate the principle of specificity by either covering the user's hand with a device commonly known as a hand paddle, or by requiring the user to perform while not in the water, which in each case deprives the user of the kinesthetic and tactile awareness of the total hand/arm complex that is generally considered to be of critical importance in swimming, the claimed invention constitutes an improvement by allowing the user to swim with an unobstructed hand.

Where prior examples in this field of endeavor are big and bulky proving difficult to move and store, the claimed invention constitutes an improvement in that it is easily portable and numerous units are readily stacked and stored in a small area.

Where prior examples in this field of endeavor allow only one user to perform in an given area at a time, the claimed invention constitutes an improvement by allowing multiple users to each use a unit of the claimed invention while performing simultaneously in the same swimming pool space, that space being commonly referred to as a lane.

Where prior examples in this field of endeavor are so costly as to prove unaffordable to the common user, the claimed invention constitutes an improvement as it will be sold at a cost readily affordable to the common user.

Where prior examples in this field of endeavor violate the principle of specificity by causing the user to strip the user's hands, feet, and limbs through the water in an unnatural manner due to the severity or immovability of the resistance applied by these examples, the claimed invention constitutes an improvement by allowing the user to select and use a resistance level that permits true and natural swimming strokes wherein the user's hands, feet, and limbs do not slip through the water.

Where prior examples in this field of endeavor violate the principle of specificity by habituating a slower swimming stroke rate and stroke length than is desired, the claimed invention constitutes an improvement by

allowing selection of the resistance level appropriate for the user's abilities, thus allowing the desired stroke rate and stroke length.

Where prior examples in this field of endeavor violate the principle of specificity by failing to provide the full range of resistance levels, in particular the higher ranges necessary to accommodate more able users, the claimed invention constitutes an improvement by providing the user with a full range of resistance levels, including those necessary to provide more able users with a stimulus for beneficial adaptation.

Where prior examples in this field of endeavor violate the principle of specificity by failing to provide the full range of resistance levels, in particular the lower ranges necessary to accommodate less able users, the claimed invention constitutes an improvement by providing the user with a full range of resistance levels, including those necessary to allow less able users to perform true swimming strokes at the desired stroke rate and stroke length.

Whereas the previously known practice wherein a user swims while towing a common bucket violates the principles of specificity and progressive overload by failing to provide the full range of resistance levels necessary to accommodate the abilities of a range of users, or to allow increases in resistance as the user improves, the claimed invention constitutes an improvement by providing a full range of resistance levels. Furthermore, whereas an attempt to address the shortcomings relating to the towing of a common bucket by providing a wide variety of bucket sizes would prove

impractical in terms of clutter at pool-side and inconvenience in storage, the claimed invention constitutes an improvement in that it provides a wide range of resistance levels per single unit, takes up little space, and numerous units are readily stacked and stored in a small area.

Where prior examples in this field of endeavor violate the principle of specificity by unavoidably causing an unnatural and deleterious force to act upon the user which acts to alter true swimming body-position, resulting in habituation of undesirable changes to swimming technique as the user naturally attempts to offset these forces, the resistance experienced by the user when using the claimed invention is directed horizontally and in direct opposition to the line of travel, as is experienced in non-resisted swimming.

Where prior examples in this field of endeavor provide only a single or a few improvements over other examples in this field of endeavor, the claimed invention presents the distinct advantage of providing all the aforementioned improvements.

Brief Description of the Several Views of the Drawing

Fig 4 shows a commercially available bucket with handle.

Fig 8 shows bucket with tabs, swivel clips, a cord, and a belt.

Fig 12 shows a bottom-view of the bucket with disc-shaped section removed, as indicated by cross-hatched area, to leave a circular rim.

Fig 16 shows another bottom-view of the bucket and circular rim, and shows a hole in the circular rim.

Fig 20 shows a disc.

Fig 24 shows a disc with a smaller disc-shaped section removed, as indicated by cross-hatched area, to leave a circular ring.

Fig 28 shows a variety of circular rings each with a different sized disc-shaped section having been removed.

Fig 32 shows a cut-away view of the bucket in profile, allowing a view of the circular ring in place.

Fig 36 shows a view of the bucket allowing a bottom-view of the circular ring in place.

Fig 40 shows a swimmer swimming while towing the bucket with circular ring in place.

Reference Numerals in Drawings

| | |
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| 104 | a commercially available bucket |
| 108 | a disc-shaped section |
| 112 | a bottom view of bucket bottom |
| 116 | a circular rim |
| 120 | tabs |
| 124 | a hole in circular ring |
| 128 | a disc |
| 132 | a smaller disc-shaped section |
| 136A | a circular ring |
| 136B | a variety of circular rings |
| 136C | a cut-away view showing circular ring in place |
| 136D | a bottom view showing circular ring in place |
| 140 | a cord |
| 144 | the cord showing its first end |
| 148 | the bucket handle |
| 152 | a swivel clip |
| 156 | the cord showing its second end |
| 160 | a belt |
| 164 | the waist of a swimmer |
| 168 | the swimmer swimming while towing the bucket |

with circular ring in place
172 the direction of water passage through bucket
176 the direction of travel of swimmer
180 water surface
184 feet of a swimmer

Detailed Description of the Invention

A description of the current contemplation of the best mode of carrying out the making and using of the claimed invention will follow after a brief explanation.

The description of the current contemplation of the best mode makes reference to commercially available buckets. Buckets can be geometrically classified as having the shape of cylinders or cones. Other modes of carrying out the claimed invention can be achieved using alternative objects instead of buckets, provided these alternative objects have geometric shapes that allow the channeling of the passage of water through their interior, the necessity and manner for which will become apparent as described in the steps for making and using the claimed invention. For purposes of clarity, it is pointed out that geometric shapes suitable for the making and using of the claimed invention include but are not limited to entire or partial versions of any manner of cylinders, cones, pyramids, rectangular boxes, cubes, prisms, and spheres. In addition, the description of the current contemplation of the best mode will make reference to a disc. Other modes of carrying out the claimed invention can be achieved using alternative objects instead of discs, provided these alternative objects have geometric shapes that accommodate the restriction of the passage of water, the necessity for which will become apparent as described in the steps for making and using the claimed

invention. For the purposes of describing the making and using of the claimed invention, the term passage of water is used in the sense that when an object moves through the water, water moves past the object in a relative manner. This is to say that an object moving through a still body of water encounters the same relative passage of water as a still object in a moving body of water, so that in either case a relative movement of water past the object can be said to occur, thus producing a passage of water.

Following is a description explaining what is currently contemplated as the best mode of carrying out the making and using of the claimed invention.

Any of a variety of desired sizes of commercially available buckets **104** is obtained, bucket **104** being made of plastic or any other material that facilitates the object of the claimed invention.

A disc-shaped section **108** is cut out of the bottom of bucket **104**, the location for which is shown in a bottom view **112**. Disc-shaped section **108** comprises seventy-five percent of the original surface area of the bottom of bucket **104**. The removal of disc-shaped section **108** leaves a circular rim **116** at the bottom of bucket **104** comprising twenty-five percent of the original surface area of the bottom of bucket **104**. As an alternative, a disc-shaped section of any desired percent surface area may be removed that facilitates the object of the claimed invention, with the percent surface area of circular rim **116** varying accordingly.

Three 1" x 1" tabs **120** are cut at intervals of one-third

the distance around the bottom of bucket **104**, each tab **120** made with two vertical cuts connected below by a third horizontal cut. Tabs **120** are then pushed inward toward the center of the interior of bucket **104**. Tabs **120** retain an inward protruding orientation due to the flexible and resilient nature of plastic or similar material. Any other desired number of tabs **120** spaced at any desired interval may be used, provided such variation facilitates the object of the claimed invention. Other modes for making tabs **120** include attaching any suitable material in any suitable manner to the same interior location in bucket **104** to protrude in an equivalent manner inward toward the center of the interior of bucket **104**.

A disc **128** is obtained, being made of plastic or any other material that facilitates the object of the claimed invention, and of a thickness being approximately equal in thickness to the material of bucket **104**, and 1/4" less in diameter than the inner diameter measured at the interior of the bottom of bucket **104**. The amount by which the diameter of disc **128** is less than the diameter of the bottom of bucket **104** may vary, provided such variation facilitates the object of the invention, as will soon become evident.

From the center of disc **128**, a smaller disc-shaped section **132** is cut and removed to leave a circular ring **136**. The size of smaller disc-shaped section **132** that is removed from disc **128** will determine the diameter of the hole of circular ring **136**. A variety of circular rings **136B** results from varying by five percent the size of smaller disc-shaped sections **132** removed from disc **128**.

As an alternative, any desired percent variation in the size of smaller disc-shaped sections **132** removed from disc **128** may be used that facilitates the object of the claimed invention. Only one circular ring **136** is used at a time when exercising or training with the claimed invention, the selection of which is based on desired exercise or training objectives. Circular ring **136** is taken and placed into the interior bottom of bucket **104** so that circular ring **136**, snaps into place below tabs **120**. This snapping into place is accommodated due to the flexible and resilient nature of plastic or similar materials. Circular ring **136** is thus locked into place between tabs **120** and circular rim **116**, as shown in views **136C** and **136D** of Fig 36.

A cord **140** having two ends and being made of plastic-coated clothesline, surgical tubing, or any other similar material that facilitates the object of the claimed invention, is cut to a length of six feet or any desired length that facilitates the object of claimed invention. A first end **144** of cord **140** is attached to a handle **148** of bucket **104** by means of a swivel clip **152** or any similar device that facilitates the object of the claimed invention. A second end **156** of cord **140** is attached in the same manner to any of a variety of commercially available belts **160** to be worn by a swimmer **168** around the waist **164**, so that the swimmer is coupled to the claimed invention for the purpose towing the claimed invention while swimming as shown in Fig 40.

With regard to operation, swimmer **168** swims while towing the claimed invention, as shown in Fig 40. As circular ring **136** restricts the passage of water being channeled

through bucket 104, the result is a force from water resistance acting in a direction 172 that places resistance on swimmer 168 traveling in an opposite direction 176, thus providing an overload to the muscles and producing the desired training effect. The claimed invention is towed just below the water surface 180 and any desired distance behind the feet 184 of swimmer 168, that desired distance being accommodated by the length of cord 140.

It is circular ring 136 that provides the restriction of the passage of water channeled through bucket 104, and it is the restriction of the passage of water channeled through bucket 104 that causes the user to experience the desired level of resistance. Disc 128 may be used intact in place of circular rings 136 when it is desired to provide the maximum degree of water resistance. Accordingly, disc 128 is one of a variety of circular rings 136B, although not shown in Fig 28.

Other modes with regard to bucket size, circular ring outside diameter, and circular ring hole size may vary, provided the degree of variation facilitates the object of the claimed invention. As described in this contemplation of best mode for making and using the claimed invention, a smaller disc-shaped section 132 was discussed as being cut and removed from the center of disc 128, to leave a circular ring 136. Other modes include making any manner of singular or plural perforations of any size and shape, provided the objective of the claimed invention is facilitated, that being in this specific instance to allow restriction of the passage of water channeled through bucket 104.

Resistance training is a widely accepted component of existing training programs for competitive swimmers. The specific advantages of the claimed invention over other devices for providing resistance exercise and training for swimmers are as follows: The claimed invention conforms to the commonly held sports science principles of specificity and progressive overload. Specificity is accommodated because the swimmer exercises or trains with the invention while in the water, the specific medium. The principle of specificity is further accommodated because the claimed invention allows for the selection of the correct resistance level to allow the swimmer to perform with desired stroke rate and desired stroke length. Studies have shown that other commonly used forms of in-water resistance training for swimmers negatively influence swimming technique and performance by causing slower than desired stroke rate and shorter than desired stroke length. The principle of progressive overload is accommodated by the claimed invention by providing a means for incremental increases in resistance levels.